CLAIMS

WHAT IS CLAIMED IS:

1. An assembly for characterizing weathering reciprocity of a material comprising:

an array of natural accelerated weathering test apparatus of the type used to concentrate solar radiation upon test specimens formed from the material;

each natural accelerated weathering test apparatus, including a temperature control system for maintaining the test specimens at a desired temperature; and

a plurality of sets of natural accelerated weathering test apparatus defined within the array, wherein the test specimens in each set are exposed to a different solar radiation intensity.

2. The assembly as recited in claim 1, wherein each natural accelerated weathering test apparatus further includes:

a target board for supporting the test specimens for exposure to the concentrated solar radiation;

a concentrating device for directing concentrated solar radiation intensity on to the target board for exposing the test specimens; and

an apparatus for adjusting a temperature of the test specimens to the desired temperature.

3. The assembly as recited in claim 1, wherein the temperature control system dynamically defines the desired temperature of the test specimens to simulate complex temperature cycles of an end-use application of the material.

4. The assembly as recited in claim 1, wherein each of the plurality of sets includes at least one natural accelerated weathering test apparatus.

5. The assembly as recited in claim 1, wherein each natural accelerated weathering test apparatus further includes a concentrating device for directing concentrated solar radiation intensity upon the test specimens.

6. The assembly as recited in claim 5, wherein each concentrating device includes at least one concentrating element.

7. The assembly as recited in claim 5, wherein each concentrating device includes a number of concentrating elements CE such that the number of concentrating elements CE is directly proportional to a number of each set S of the plurality of sets, whereby the number of concentrating elements is determined from the equation: CE=S.

8. The assembly as recited in claim 5, wherein each concentrating device includes a number of concentrating elements CE such that the number of concentrating elements CE is proportional to a number of each set S of the plurality of sets, whereby the number of concentrating elements is determined from the equation: CE=S*2.

9. The assembly as recited in claim 8, wherein a first set includes two concentrating elements; a second set includes four concentrating elements; a third set includes six concentrating elements; a fourth set includes eight concentrating elements; and a fifth set includes ten concentrating elements.

10. The assembly as recited in claim 6, wherein each concentrating element may be adjusted with respect to the test specimens in order to provide the different solar radiation intensity.

11. The assembly as recited in claim 5, wherein each concentrating device has a focal length which may be adjusted with respect to the test specimens in order to provide the different solar radiation intensity.

12. The assembly as recited in claim 1, wherein the temperature control system includes:

an input device which continuously generates a dynamic reference signal representative of a complex temperature cycle of an end-use application of the material; and

a controller connected to the input device such that the controller is responsive to the dynamic reference signal for selectively maintaining the desired temperature.

13. The assembly as recited in claim 12, wherein the input device of a first natural accelerated weathering test apparatus is disposed remote from the array.

14. The assembly as recited in claim 13, wherein the input device of each other natural accelerated weathering test apparatus consecutively links in series the first one natural accelerated weathering test apparatus and the other natural accelerated weathering test apparatus of the array such that the other natural accelerated weathering test apparatus are dependently controlled from the first one natural accelerated weathering test apparatus.

15. The assembly as recited in claim 13, wherein the input device of each other natural accelerated weathering test apparatus is connected to the first one natural accelerated weathering test apparatus.

16. The assembly cited by claim 12, wherein the input device is one of a temperature sensitive component, an apparatus for replaying a recorded environment temperature cycle, an apparatus for generating a complex temperature cycle and a non-contact monitoring device.

17. The assembly as recited in claim 2, wherein the temperature control system includes:

a feedback device mounted to the target board for exposure to the concentrated solar radiation and generating a test signal responsive to a temperature thereof and representative of a test specimen temperature;

an input device for continuously generating a dynamic reference signal representative of a complex temperature cycle of an end-use application of the material; and

a controller connected to the input device and the feedback device; the controller responsive to the dynamic reference signal and the test signal for generating a control signal representative of the desired temperature for selectively controlling the apparatus in order to control adjustment of the temperature of the test specimen to the desired temperature, the adjustment being generally increased when the test specimen temperature is greater than the desired temperature, and the adjustment being generally decreased when the test specimen temperature is less than the desired temperature, and the adjustment being generally maintained constant when the test specimen temperature is substantially equal to the desired temperature.

18. The assembly cited by claim 17, wherein the input device is one of a temperature sensitive component, an apparatus for replaying a recorded environment temperature cycle, an apparatus for generating a complex temperature cycle and a non-contact monitoring device.

19. The assembly recited by claim 17, wherein the feedback device is one of a temperature sensitive component and a non-contact monitoring device.

20. The assembly recited by claim 17, wherein the feedback device is connected in a heat conductive relationship to a panel mounted to the target board.

21. The assembly recited by claim 20, wherein the feedback device further includes a black coating overlying the feedback device and the panel for absorbing the solar radiation intensity impinging thereon.

22. The assembly as recited in claim 17, wherein the apparatus includes an air circulation device for moving ambient air over the target board, said air circulation device including an electric motor and a fan powered by the electric motor for creating a flow of ambient air.

23. The assembly as recited in claim 17, wherein the apparatus includes a base contiguous with the test specimens and at least one fin which extends from the base into an air tunnel having a fan for moving air therethrough in order to dissipate heat from the specimen to air moved through the air tunnel by the fan.

24. The assembly as recited in claim 23, wherein the apparatus is a metallic heat sink.

25. The assembly as recited in claim 17, wherein the apparatus includes a base contiguous with the test specimens, at least two legs which extend from the base into an air tunnel having a fan for moving air therethrough in order to dissipate heat from the test specimens to the air moving through the air tunnel, a top connected to each leg having a first end and a second end and a voltage source applied across the first and second ends of the top.

26. The assembly as recited in claim 25, wherein adjacent legs are constructed of dissimilar semiconductor material.

27. The assembly as recited in claim 17, wherein the apparatus includes a flexible walled vessel containing a coolant adequate to adjust the desired temperature of the test specimens wherein the flexible walled vessel conforms to the test specimens as a result of the coolant disposed therein.

28. The assembly as recited in claim 27, wherein the flexible walled vessel is operatively connected to an inlet in communication with a coolant source and an outlet regulated to remove the coolant from the flexible walled vessel at a desired rate.

29. The assembly as recited in claim 27, wherein the coolant is selected from the group consisting essentially of refrigerated air, ethylene glycol, fluorocarbon refrigerants, alcohol, refrigerant gases and fluids used for heat exchange.

30. An assembly for characterizing weathering reciprocity of a material comprising:

an array of natural accelerated weathering test apparatus of the type used to concentrate solar radiation upon test specimens formed from the material;

each natural accelerated weathering test apparatus including a temperature control system for maintaining the test specimens at a desired temperature;

a plurality of sets of natural accelerated weathering test apparatus defined within the array;

the test specimens in each set exposed to a different solar radiation intensity;

a plurality of groups of natural accelerated weathering test apparatus defined within the array; and

the test specimens in each group maintained at a temperature offset relative to the desired temperature.

31. The assembly as recited in claim 30, wherein each natural accelerated weathering test apparatus further includes:

a target board for supporting the test specimens for exposure to the concentrated solar radiation;

a concentrating device for directing concentrated solar radiation intensity on to the target board for exposing the test specimens; and

an apparatus for adjusting the temperature of the test specimens to the desired temperature.

32. The assembly as recited in claim 30, wherein the temperature control system dynamically defines the desired temperature of the test specimens to simulate complex temperature cycles of an end-use application of the material.

33. The assembly as recited in claim 30, wherein each of the plurality of sets includes at least one natural accelerated weathering test apparatus.

34. The assembly as recited in claim 30, wherein each natural accelerated weathering test apparatus further includes a concentrating device for directing concentrated solar radiation intensity upon the test specimens.

35. The assembly as recited in claim 34, wherein each concentrating device includes at least one concentrating element.

36. The assembly as recited in claim 34, wherein each concentrating device includes a number of concentrating elements CE such that the number of concentrating elements CE is directly proportional to a number of each set S of the plurality of sets, whereby the number of concentrating elements is determined from the equation: CE=S.

37. The assembly as recited in claim 34, wherein each concentrating device includes a number of concentrating elements CE such that the number of concentrating elements CE is proportional to a number of each set S of the plurality of sets, whereby the number of concentrating elements is determined from the equation: CE=S*2.

38. The assembly as recited in claim 37, wherein a first set includes two concentrating elements; a second set includes four concentrating elements; a third set includes six concentrating elements; a fourth set includes eight concentrating elements; and a fifth set includes ten concentrating elements.

39. The assembly as recited in claim 35, wherein each concentrating element may be adjusted with respect to the test specimens in order to provide the different solar radiation intensity.

40. The assembly as recited in claim 34, wherein each concentrating device has a focal length which may be adjusted with respect to the test specimens in order to provide the different solar radiation intensity.

41. The assembly as recited in claim 30, wherein the temperature control system includes:

an input device which continuously generates a dynamic reference signal representative of a complex temperature cycle of an end-use application of the material; and

a controller connected to the input device such that the controller is responsive to the dynamic reference signal for selectively maintaining the desired temperature.

42. The assembly as recited in claim 41, wherein the input device of a first one natural accelerated weathering test apparatus is disposed remote from the array.

43. The assembly as recited in claim 42, wherein the input device of each other natural accelerated weathering test apparatus consecutively links in series the first one natural accelerated weathering test apparatus and the other natural accelerated weathering test apparatus of the array such that the other natural accelerated weathering test apparatus are dependently controlled from the first one natural accelerated weathering test apparatus.

44. The assembly as recited in claim 42, wherein the input device of each other natural accelerated weathering test apparatus is connected to the first one natural accelerated weathering test apparatus.

45. The assembly cited by claim 41, wherein the input device is one of a temperature sensitive component, an apparatus for replaying a recorded environment temperature cycle, an apparatus for generating a complex temperature cycle and a non-contact monitoring device.

46. The assembly as recited in claim 31, wherein the temperature control system includes:

a feedback device mounted to the target board for exposure to the concentrated solar radiation and generating a test signal responsive to a temperature thereof and representative of a test specimen temperature;

an input device for continuously generating a dynamic reference signal representative of a complex temperature cycle of an end-use application of the material; and

a controller connected to the input device and the feedback device; the controller responsive to the dynamic reference signal and the test signal for generating a control signal representative of the desired temperature for selectively controlling the apparatus in order to control adjustment of the temperature of the test specimen to the desired temperature, the adjustment being generally increased when the test specimen temperature is greater than the desired temperature, and the adjustment being generally decreased when the test specimen temperature is less than the desired temperature, and the adjustment being generally maintained constant when the test specimen temperature is substantially equal to the desired temperature.

47. The assembly cited by claim 46, wherein the input device is one of a temperature sensitive component, an apparatus for replaying a recorded environment temperature cycle, an apparatus for generating a complex temperature cycle and a non-contact monitoring device.

48. The assembly recited by claim 46, wherein the feedback device is one of a temperature sensitive component and a non-contact monitoring device.

49. The assembly as recited in claim 46, wherein the apparatus includes an air circulation device for moving ambient air over the target board, said air circulation device including an electric motor and a fan powered by the electric motor for creating a flow of ambient air.

50. The assembly as recited in claim 46, wherein the feedback device is connected in a heat conductive relationship to a panel mounted to the target board.

51. The assembly as recited in claim 46, wherein the feedback device further includes a black coating overlying the feedback device and the panel for absorbing the solar radiation intensity impinging thereon.

52. The assembly as recited in claim 46, wherein the apparatus includes a base contiguous with the test specimens and at least one fin which extends from the base into an air tunnel having a fan for moving air therethrough in order to dissipate heat from the specimen to air moved through the air tunnel by the fan.

53. The assembly as recited in claim 52, wherein the apparatus is a metallic heat sink.

54. The assembly as recited in claim 46, wherein the apparatus includes a base contiguous with the test specimens, at least two legs which extend from the base into an air tunnel having a fan for moving air therethrough in order to dissipate heat from the test specimens to the air moving through the air tunnel, a top connected to each leg having a first end and a second end and a voltage source applied across the first and second ends of the top.

55. The assembly as recited in claim 54, wherein adjacent legs are constructed of dissimilar semiconductor material.

56. The assembly as recited in claim 46, wherein the apparatus includes a flexible walled vessel containing a coolant adequate to adjust the desired temperature of the test specimens wherein the flexible walled vessel conforms to the test specimens as a result of the coolant disposed therein.

57. The assembly as recited in claim 56, wherein the flexible walled vessel is operatively connected to an inlet in communication with a coolant source and an outlet regulated to remove the coolant from the flexible walled vessel at a desired rate.

58. The assembly as recited in claim 56, wherein the coolant is selected from the group consisting essentially of refrigerated air, ethylene glycol, fluorocarbon refrigerants, alcohol, refrigerant gases and fluids used for heat exchange.

59. The assembly as recited in claim 30, wherein the offset is one of an absolute offset, a proportional offset, a function offset and no offset.

60. The assembly as recited in claim 41, wherein the controller further includes an offset device for applying the offset to the desired temperature.

61. The assembly as recited in claim 60, wherein the offset is one of an absolute offset, a proportional offset, a function offset and no offset.

62. The assembly as recited in claim 46, wherein the controller further includes an offset device for applying an offset to the desired temperature.

63. The assembly as recited in claim 62, wherein the offset is one of an absolute offset, a proportional offset, a function offset and no offset.

64. The assembly as recited in claim 30, wherein each group includes at least one natural accelerated weathering test apparatus from each set.

65. The assembly as recited in claim 30, wherein the plurality of groups includes:

a first group having test specimens at a first offset from the desired temperature;

a second group having test specimens at a second offset from the desired temperature; and

a third group having test specimens at a third offset from the desired temperature.

66. The assembly as recited in claim 65, wherein the first, second and third offsets are each one of an absolute offset, a proportional offset, a function offset and no offset.

67. An assembly for characterizing weathering reciprocity of a material comprising:

a plurality of arrays of natural accelerated weathering test apparatus of the type used to concentrate solar radiation upon test specimens formed from the material;

each natural accelerated weathering test apparatus including a temperature control system for maintaining the test specimens at a desired temperature;

a plurality of sets of natural accelerated weathering test apparatus defined within each array;

the test specimens in each set exposed to a different solar radiation intensity;

a plurality of groups of natural accelerated weathering test apparatus defined within each array;

the test specimens in each group maintained at a temperature offset relative to the desired temperature; and

the test specimens of each array exposed to a different desired solar radiation wavelength range.

68. The assembly as recited in claim 67, wherein each natural accelerated weathering test apparatus further includes:

a target board for supporting the test specimens for exposure to the concentrated solar radiation;

a concentrating device for directing concentrated solar radiation intensity on to the target board for exposing the test specimens; and

an apparatus for adjusting a temperature of the test specimens to the desired temperature.

69. The assembly as recited in claim 67, wherein the temperature control system dynamically defines the desired temperature of the test

specimens to simulate complex temperature cycles of an end-use application of the material.

70. The assembly as recited in claim 67, wherein each of the plurality of sets includes at least one natural accelerated weathering test apparatus.

71. The assembly as recited in claim 67, wherein each natural accelerated weathering test apparatus further includes a concentrating device for directing concentrated solar radiation intensity upon the test specimens.

72. The assembly as recited in claim 71, wherein each concentrating device includes at least one concentrating element.

73. The assembly as recited in claim 71, wherein each concentrating device includes a number of concentrating elements CE such that the number of concentrating elements CE is directly proportional to a number of each set S of the plurality of sets, whereby the number of concentrating elements is determined from the equation: CE=S.

74. The assembly as recited in claim 71, wherein each concentrating device includes a number of concentrating elements CE such that the number of concentrating elements CE is proportional to a number of each set S of the plurality of sets, whereby the number of concentrating elements is determined from the equation: CE=S*2.

75. The assembly as recited in claim 74, wherein a first set includes two concentrating elements; a second set includes four concentrating elements; a third set includes six concentrating elements; a fourth set includes eight concentrating elements; and a fifth set includes ten concentrating elements.

76. The assembly as recited in claim 72, wherein each concentrating element may be adjusted with respect to the test specimens in order to provide the different solar radiation intensity.

77. The assembly as recited in claim 71, wherein each concentrating device has a focal length which may be adjusted with respect to the test specimens in order to provide the different solar radiation intensity.

78. The assembly as recited in claim 67, wherein the temperature control system includes:

an input device which continuously generates a dynamic reference signal representative of a complex temperature cycle of an end-use application of the material; and

a controller connected to the input device such that the controller is responsive to the dynamic reference signal for selectively maintaining the desired temperature.

79. The assembly as recited in claim 78, wherein the input device of a first one natural accelerated weathering test apparatus is disposed remote from the array.

80. The assembly as recited in claim 79, wherein the input device of each other natural accelerated weathering test apparatus consecutively links in

series the first one natural accelerated weathering test apparatus and the other natural accelerated weathering test apparatus of the array such that the other natural accelerated weathering test apparatus are dependently controlled from the first one natural accelerated weathering test apparatus.

81. The assembly as recited in claim 79, wherein the input device of each other natural accelerated weathering test apparatus is connected to the first one natural accelerated weathering test apparatus.

82. The assembly cited by claim 78, wherein the input device is one of a temperature sensitive component, an apparatus for replaying a recorded environment temperature cycle, an apparatus for generating a complex temperature cycle and a non-contact monitoring device.

83. The assembly as recited in claim 68, wherein the temperature control system includes:

a feedback device mounted to the target board for exposure to the concentrated solar radiation and generating a test signal responsive to a temperature thereof and representative of a test specimen temperature;

an input device for continuously generating a dynamic reference signal representative of a complex temperature cycle of an end-use application of the material; and

a controller connected to the input device and the feedback device; the controller responsive to the dynamic reference signal and the test signal for generating a control signal representative of the desired temperature for selectively controlling the apparatus in order to control adjustment of the temperature of the test specimens to the desired temperature, the adjustment being generally increased when the test specimen temperature is greater than the desired temperature, and the adjustment being generally decreased when the test specimen temperature is less than the desired temperature, and the

adjustment being generally maintained constant when the test specimen temperature is substantially equal to the desired temperature.

84. The assembly cited by claim 83, wherein the input device is one of a temperature sensitive component, an apparatus for replaying a recorded environment temperature cycle, an apparatus for generating a complex temperature cycle and a non-contact monitoring device.

85. The assembly recited by claim 83, wherein the feedback device is one of a temperature sensitive component and a non-contact monitoring device.

86. The assembly as recited in claim 83, wherein the apparatus includes an air circulation device for moving ambient air over the target board, said air circulation device including an electric motor and a fan powered by the electric motor for creating a flow of ambient air.

87. The assembly as recited in claim 83, wherein the feedback device is connected in a heat conductive relationship to a panel mounted to the target board.

88. The assembly as recited in claim 83, wherein the feedback device further includes a black coating overlying the feedback device and the panel for absorbing the solar radiation intensity impinging thereon.

89. The assembly as recited in claim 83, wherein the apparatus includes a base contiguous with the test specimens and at least one fin which

extends from the base into an air tunnel having a fan for moving air therethrough in order to dissipate heat from the specimen to air moved through the air tunnel by the fan.

90. The assembly as recited in claim 89, wherein the apparatus is a metallic heat sink.

91. The assembly as recited in claim 83, wherein the apparatus includes a base contiguous with the test specimens, at least two legs which extend from the base into an air tunnel having a fan for moving air therethrough in order to dissipate heat from the test specimens to the air moving through the air tunnel, a top connected to each leg having a first end and a second end and a voltage source applied across the first and second ends of the top.

92. The assembly as recited in claim 91, wherein adjacent legs are constructed of dissimilar semiconductor material.

93. The assembly as recited in claim 83, wherein the apparatus includes a flexible walled vessel containing a coolant adequate to adjust the desired temperature of the test specimens wherein the flexible walled vessel conforms to the test specimens as a result of the coolant disposed therein.

94. The assembly as recited in claim 93, wherein the flexible walled vessel is operatively connected to an inlet in communication with a coolant

source and an outlet regulated to remove the coolant from the flexible walled vessel at a desired rate.

95. The assembly as recited in claim 93, wherein the coolant is selected from the group consisting essentially of refrigerated air, ethylene glycol, fluorocarbon refrigerants, alcohol, refrigerant gases and fluids used for heat exchange.

96. The assembly as recited in claim 67, wherein the offset is one of an absolute offset, a proportional offset, a function offset and no offset.

97. The assembly as recited in claim 78, wherein the controller further includes an offset device for applying the offset to the desired temperature.

98. The assembly as recited in claim 97, wherein the offset applied to the desired temperature is one of an absolute offset, a proportional offset, a function offset and no offset.

99. The assembly as recited in claim 83, wherein the controller further includes an offset device for applying an offset to the desired temperature.

100. The assembly as recited in claim 99, wherein the offset applied to the desired temperature is one of an absolute offset, a proportional offset, a function offset and no offset.

101. The assembly as recited in claim 67, wherein each group includes at least one natural accelerated weathering test apparatus from each set.

102. The assembly as recited in claim 67, wherein the plurality of groups includes:

a first group having test specimens at a first offset from the desired temperature;

a second group having test specimens at a second offset from the desired temperature; and

a third group having test specimens at a third offset from the desired temperature.

103. The assembly as recited in claim 102, wherein the first, second and third offsets are each one of an absolute offset, a proportional offset, a function offset and no offset.

104. The assembly as recited in claim 67, wherein the plurality of arrays includes:

a first array having test specimens exposed to a first preselected wavelength range;

a second array having test specimens exposed to a second preselected wavelength range; and

a third array having test specimens exposed to a third preselected wavelength range.

105. A method for characterizing weathering reciprocity of a material comprising:

configuring a plurality of natural accelerated weathering test apparatus of the type used to concentrate solar radiation upon test specimens formed from the material in an array;

connecting a temperature control system to each natural accelerated weathering test apparatus disposed in the array;

defining a plurality of sets of natural accelerated weathering test apparatus within the array;

maintaining the test specimens at a desired temperature; and

exposing the test specimens in each set to a different solar radiation intensity.

106. The method as recited in claim 105, wherein the desired temperature is dynamically defined by the temperature control system to simulate complex temperature cycles of an end-use application of the material.

107. The method as recited in claim 105, wherein each natural accelerated weathering test apparatus further includes a concentrating device for directing concentrated solar radiation intensity upon the test specimens.

108. The method as recited in claim 107, wherein each concentrating device includes at least one concentrating element.

109. The method as recited in claim 107, wherein each concentrating device includes a number of concentrating elements CE such that the number of concentrating elements CE is directly proportional to a number of each set S of the plurality of sets, whereby the number of concentrating elements is determined from the equation: CE=S.

110. The method as recited in claim 107, wherein each concentrating device includes a number of concentrating elements CE such that the number of concentrating elements CE is proportional to a number of each set S of the plurality of sets, whereby the number of concentrating elements is determined from the equation: CE=S*2.

111. The method as recited in claim 110, wherein a first set includes two concentrating elements; a second set includes four concentrating elements; a third set includes six concentrating elements; a fourth set includes eight concentrating elements; and a fifth set includes ten concentrating elements.

112. The method as recited in claim 108, wherein the step of exposing the test specimens comprises configuring each set in the array such that the concentrating devices in each set have a different number of concentrating elements.

113. The method as recited in claim 108, wherein each concentrating element may be adjusted with respect to the test specimens in order to provide the different solar radiation intensity.

114. The method as recited in claim 107, wherein each concentrating device has a focal length which may be adjusted with respect to the test specimens in order to provide the different solar radiation intensity.

115. A method for characterizing weathering reciprocity of a material comprising:

configuring a plurality of natural accelerated weathering test apparatus of the type used to concentrate solar radiation upon test specimens formed form the material in an array;

connecting a temperature control system to each natural accelerated weathering test apparatus disposed in the array;

defining a plurality of sets of natural accelerated weathering test apparatus within the array;

defining a plurality of groups of natural accelerated weathering test apparatus within the array;

determining a desired temperature for the test specimens;

exposing the test specimens in each set to a different solar radiation intensity; and

maintaining the test specimens in each group at a temperature offset to the desired temperature.

116. The method as recited in claim 115, wherein the desired temperature is dynamically defined by the temperature control system to simulate complex temperature cycles of an end-use application of the material.

117. The method as recited in claim 115, wherein each natural accelerated weathering test apparatus further includes a concentrating device for directing concentrated solar radiation intensity upon the test specimens.

118. The method as recited in claim 117, wherein each concentrating device includes at least one concentrating element.

119. The method as recited in claim 117, wherein each concentrating device includes a number of concentrating elements CE such that the number of concentrating elements CE is directly proportional to a number of each set S of the plurality of sets, whereby the number of concentrating elements is determined from the equation: CE=S.

120. The method as recited in claim 117, wherein each concentrating device includes a number of concentrating elements CE such that the number of concentrating elements CE is proportional to a number of each set S of the plurality of sets, whereby the number of concentrating elements is determined from the equation: CE=S*2.

121. The method as recited in claim 120, wherein a first set includes two concentrating elements; a second set includes four concentrating elements; a third set includes six concentrating elements; a fourth set includes eight concentrating elements; and a fifth set includes ten concentrating elements.

122. The method as recited in claim 118, wherein the step of exposing the test specimens comprises configuring each set in the array such that the concentrating devices in each set have a different number of concentrating elements.

123. The method as recited in claim 118, wherein each concentrating element may be adjusted with respect to the test specimens in order to provide the different solar radiation intensity.

124. The method as recited in claim 117, wherein each concentrating device has a focal length which may be adjusted with respect to the test specimens in order to provide the different solar radiation intensity.

125. The method as recited in claim 115, wherein the temperature control system includes:

an input device which continuously generates a dynamic reference signal representative of a complex temperature cycle of an end-use application of the material; and

a controller connected to the input device such that the controller is responsive to the dynamic reference signal for selectively maintaining the desired temperature.

126. The method as recited in claim 125, wherein the input device of a first one natural accelerated weathering test apparatus is disposed remote from the array.

127. The method as recited in claim 126, wherein the input device of each other natural accelerated weathering test apparatus consecutively links in series the first one natural accelerated weathering test apparatus and the other natural accelerated weathering test apparatus of the array such that the other natural accelerated weathering test apparatus are dependently controlled from the first one natural accelerated weathering test apparatus.

128. The method as recited in claim 126, wherein the input device of each other natural accelerated weathering test apparatus is connected to the first one natural accelerated weathering test apparatus.

129. The method cited by claim 125, wherein the input device is one of a temperature sensitive component, an apparatus for replaying a recorded environment temperature cycle, an apparatus for generating a complex temperature cycle and a non-contact monitoring device.

130. The method as recited in claim 125, wherein each natural accelerated weathering test apparatus further including:

a target board for supporting the test specimens for exposure to the concentrated solar radiation;

a concentrating device for directing concentrated solar radiation intensity on to the target board for exposing the test specimens; and

an apparatus for adjusting the temperature of the test specimens to the desired temperature.

131. The method as recited in claim 130, wherein the temperature control system includes:

a feedback device mounted to the target board for exposure to the concentrated solar radiation and generating a test signal responsive to a temperature thereof and representative of a test specimen temperature;

an input device for continuously generating a dynamic reference signal representative of a complex temperature cycle of an end-use application of the material; and

a controller connected to the input device and the feedback device; the controller responsive to the dynamic reference signal and the test signal for generating a control signal representative of the desired temperature for selectively controlling the apparatus in order to control adjustment of the temperature of the test specimens to the desired temperature, the adjustment being generally increased when the test specimen temperature is greater than the desired temperature, and the adjustment being generally decreased when the test specimen temperature is less than the desired temperature, and the adjustment being generally maintained constant when the test specimen temperature is substantially equal to the desired temperature.

132. The method cited by claim 131, wherein the input device is one of a temperature sensitive component, an apparatus for replaying a recorded environment temperature cycle; an apparatus for generating a complex temperature cycle and a non-contact monitoring device.

133. The method recited by claim 131, wherein the feedback device is one of a temperature sensitive component and a non-contact monitoring device.

134. The method as recited in claim 131, wherein the apparatus includes an air circulation device for moving ambient air over the target board, said air circulation device including an electric motor and a fan powered by the electric motor for creating a flow of ambient air.

135. The method as recited in claim 131, wherein the feedback device is connected in a heat conductive relationship to a panel mounted to the target board.

136. The method as recited in claim 131, wherein the feedback device further includes a black coating overlying the feedback device and the panel for absorbing the solar radiation intensity impinging thereon.

137. The method as recited in claim 131, wherein the apparatus includes a base contiguous with the test specimens and at least one fin which extends from the base into an air tunnel having a fan for moving air

therethrough in order to dissipate heat from the specimen to air moved through the air tunnel by the fan.

138. The method as recited in claim 137, wherein the apparatus is a metallic heat sink.

139. The method as recited in claim 131, wherein the apparatus includes a base contiguous with the test specimens, at least two legs which extend from the base into an air tunnel having a fan for moving air therethrough in order to dissipate heat from the test specimens to the air moving through the air tunnel, a top connected to each leg having a first end and a second end and a voltage source applied across the first and second ends of the top.

140. The method as recited in claim 139, wherein adjacent legs are constructed of dissimilar semiconductor material.

141. The method as recited in claim 131, wherein the apparatus includes a flexible walled vessel containing a coolant adequate to adjust the desired temperature of the test specimens wherein the flexible walled vessel conforms to the test specimens as a result of the coolant disposed therein.

142. The method as recited in claim 141, wherein the flexible walled vessel is operatively connected to an inlet in communication with a coolant source and an outlet regulated to remove the coolant from the flexible walled vessel at a desired rate.

143. The method as recited in claim 141, wherein the coolant is selected from the group consisting essentially of refrigerated air, ethylene glycol, fluorocarbon refrigerants, alcohol, refrigerant gases and fluids used for heat exchange.

144. The method as recited in claim 115, wherein the offset is one of an absolute offset, a proportional offset, a function offset and no offset.

145. The method as recited in claim 125, wherein the controller further includes an offset device for applying the offset to the desired temperature.

146. The method as recited in claim 145, wherein the offset is one of an absolute offset, a proportional offset, a function offset and no offset.

147. The method as recited in claim 131, wherein the controller further includes an offset device for applying an offset to the desired temperature.

148. The method as recited in claim 147, wherein the offset is one of an absolute offset, a proportional offset, a function offset and no offset.

149. The method as recited in claim 115, wherein each group includes at least one natural accelerated weathering test apparatus from each set.

150. The method as recited in claim 115, wherein the plurality of groups includes:

a first group having test specimens at a first offset from the desired temperature;

a second group having test specimens at a second offset from the desired temperature; and

a third group having test specimens at a third offset from the desired temperature.

151. The method as recited in claim 150, wherein the first, second and third offsets are each one of an absolute offset, a proportional offset, a function offset and no offset.

152. A method for characterizing weathering reciprocity of a material comprising:

configuring a plurality of natural accelerated weathering test apparatus of the type used to concentrate solar radiation upon test specimens formed from the material in a plurality of arrays;

connecting a temperature control system to each natural accelerated weathering test apparatus disposed in each array;

defining a plurality of sets of natural accelerated weathering test apparatus within each array;

defining a plurality of groups of natural accelerated weathering test apparatus within each array;

determining a desired temperature for the test specimens;

exposing the test specimens in each set to a different solar radiation intensity;

maintaining the test specimens in each group at a temperature offset to the desired temperature; and

exposing the test specimens in each array to a different desired solar radiation wavelength range.

153. The method as recited in claim 152, wherein the desired temperature is dynamically defined by the temperature control system to simulate complex temperature cycles of an end-use application of the material.

154. The method as recited in claim 152, wherein each natural accelerated weathering test apparatus further includes a concentrating device for directing concentrated solar radiation intensity upon the test specimens.

155. The method as recited in claim 154, wherein each concentrating device includes at least one concentrating element.

156. The method as recited in claim 154, wherein each concentrating device includes a number of concentrating elements CE such that the number of concentrating elements CE is directly proportional to a number of each set S of the plurality of sets, whereby the number of concentrating elements is determined from the equation: CE=S.

157. The method as recited in claim 154, wherein each concentrating device includes a number of concentrating elements CE such that the number of concentrating elements CE is proportional to a number of each set S of the plurality of sets, whereby the number of concentrating elements is determined from the equation: CE=S*2.

158. The method as recited in claim 157, wherein a first set includes two concentrating elements; a second set includes four concentrating elements; a third set includes six concentrating elements; a fourth set includes eight concentrating elements; and a fifth set includes ten concentrating elements.

159. The method as recited in claim 155, wherein the step of exposing the test specimens comprises configuring each set in the array such that the

concentrating devices in each set have a different number of concentrating elements.

160. The method as recited in claim 155, wherein each concentrating element may be adjusted with respect to the test specimens in order to provide the different solar radiation intensity.

161. The method as recited in claim 154, wherein each concentrating device has a focal length that may be adjusted with respect to the test specimens in order to provide the different solar radiation intensity.

162. The method as recited in claim 152, wherein the temperature control system includes:

an input device which continuously generates a dynamic reference signal representative of a complex temperature cycle of an end-use application of the material; and

a controller connected to the input device such that the controller is responsive to the dynamic reference signal for selectively maintaining the desired temperature.

163. The method as recited in claim 162, wherein the input device of a first one natural accelerated weathering test apparatus is disposed remote from the array.

164. The method as recited in claim 163, wherein the input device of each other natural accelerated weathering test apparatus consecutively links in series the first one natural accelerated weathering test apparatus and the other natural accelerated weathering test apparatus of the array such that the other

natural accelerated weathering test apparatus are dependently controlled from the first one natural accelerated weathering test apparatus.

165. The method as recited in claim 163, wherein the input device of each other natural accelerated weathering test apparatus is connected to the first one natural accelerated weathering test apparatus.

166. The method cited by claim 162, wherein the input device is one of a temperature sensitive component, an apparatus for replaying a recorded environment temperature cycle, an apparatus for generating a complex temperature cycle and a non-contact monitoring device.

167. The method as recited in claim 152, wherein each natural accelerated weathering test apparatus further including:

a target board for supporting the test specimens for exposure to the concentrated solar radiation;

a concentrating device for directing concentrated solar radiation intensity on to the target board for exposing the test specimens; and

an apparatus for adjusting the temperature of the test specimens to the desired temperature.

168. The method as recited in claim 167, wherein the temperature control system includes:

a feedback device mounted to the target board for exposure to the concentrated solar radiation and generating a test signal responsive to a temperature thereof and representative of a test specimen temperature;

an input device for continuously generating a dynamic reference signal representative of a complex temperature cycle of an end-use application of the material; and

a controller connected to the input device and the feedback device; the controller responsive to the dynamic reference signal and the test signal for generating a control signal representative of the desired temperature for selectively controlling the apparatus in order to control adjustment of the temperature of the test specimens to the desired temperature, the adjustment being generally increased when the test specimen temperature is greater than the desired temperature, and the adjustment being generally decreased when the test specimen temperature is less than the desired temperature, and the adjustment being generally maintained constant when the test specimen temperature is substantially equal to the desired temperature.

169. The method cited by claim 168, wherein the input device is one of a temperature sensitive component, an apparatus for replaying a recorded environment temperature cycle, an apparatus for generating a complex temperature cycle and a non-contact monitoring device.

170. The method recited by claim 168, wherein the feedback device is one of a temperature sensitive component and a non-contact monitoring device.

171. The method as recited in claim 168, wherein the apparatus includes an air circulation device for moving ambient air over the target board, said air circulation device including an electric motor and a fan powered by the electric motor for creating a flow of ambient air.

172. The method as recited in claim 168, wherein the feedback device is connected in a heat conductive relationship to a panel mounted to the target board.

173. The method as recited in claim 168, wherein the feedback device further includes a black coating overlying the feedback device and the panel for absorbing the solar radiation intensity impinging thereon.

174. The method as recited in claim 168, wherein the apparatus includes a base contiguous with the test specimens and at least one fin which extends from the base into an air tunnel having a fan for moving air therethrough in order to dissipate heat from the specimen to air moved through the air tunnel by the fan.

175. The method as recited in claim 174, wherein the apparatus is a metallic heat sink.

176. The method as recited in claim 168, wherein the apparatus includes a base contiguous with the test specimens, at least two legs which extend from the base into an air tunnel having a fan for moving air therethrough in order to dissipate heat from the test specimens to the air moving through the air tunnel, a top connected to each leg having a first end and a second end and a voltage source applied across the first and second ends of the top.

177. The method as recited in claim 176, wherein adjacent legs are constructed of dissimilar semiconductor material.

178. The method as recited in claim 168, wherein the apparatus includes a flexible walled vessel containing a coolant adequate to adjust the

desired temperature of the test specimens wherein the flexible walled vessel conforms to the test specimens as a result of the coolant disposed therein.

179. The method as recited in claim 178, wherein the flexible walled vessel is operatively connected to an inlet in communication with a coolant source and an outlet regulated to remove the coolant from the flexible walled vessel at a desired rate.

180. The method as recited in claim 178, wherein the coolant is selected from the group consisting essentially of refrigerated air, ethylene glycol, fluorocarbon refrigerants, alcohol, refrigerant gases and fluids used for heat exchange.

181. The method as recited in claim 152, wherein the offset is one of an absolute offset, a proportional offset, a function offset and no offset.

182. The method as recited in claim 162, wherein the controller further includes an offset device for applying the offset to the desired temperature.

183. The method as recited in claim 182, wherein the offset is one of an absolute offset, a proportional offset, a function offset and no offset.

184. The method as recited in claim 168, wherein the controller further includes an offset device for applying an offset to the desired temperature.

185. The method as recited in claim 184, wherein the offset is one of an absolute offset, a proportional offset, a function offset and no offset.

186. The method as recited in claim 152, wherein each group includes at least one natural accelerated weathering test apparatus from each set.

187. The method as recited in claim 152, wherein the plurality of groups includes:

a first group having test specimens at a first offset from the desired temperature;

a second group having test specimens at a second offset from the desired temperature; and

a third group having test specimens at a third offset from the desired temperature.

188. The method as recited in claim 187, wherein the first, second and third offsets are each one of an absolute offset, a proportional offset, a function offset and no offset.

189. The method as recited in claim 152, wherein the plurality of arrays includes:

a first array having test specimens exposed to a first preselected wavelength range;

a second array having test specimens exposed to a second preselected wavelength range; and

a third array having test specimens exposed to a third preselected wavelength range.